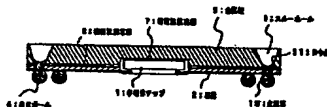


WPI

- TI - Semiconductor device package structure - includes metal plate and conductor foil which are electrically connected to ground potential
- AB - J10326963 The structure is made up of BGA type insulating film. The semiconductor device has a metal plate (5) in its base and an external conductor foil.
- A through hole (9) is provided in the metal plate, to connect it to conductor foil at ground potential. An electrical connection is formed between metal plate and conductor foil, using metal bulb and wax material.
- ADVANTAGE - Simplifies manufacturing process and reduces cost.
- (Dwg.2/12)
- PN - JP3013809B2 B2 20000228 DW200015 H05K1/05 008pp
- JP10326963 A 19981208 DW199908 H05K3/40 008pp
- PR - JP19970150053 19970523
- PA - (NIDE ) NEC CORP
- MC - U11-D01A3A
- DC - U11
- IC - H05K1/05 ;H05K1/11 ;H05K3/34 ;H05K3/40 ;H05K3/44
- AN - 1999-091953 [08]

PAJ

- TI - PACKAGE FOR SEMICONDUCTOR DEVICE AND MANUFACTURE THEREOF
- AB - PROBLEM TO BE SOLVED: To manufacture a semiconductor device having stabilized high speed electric characteristics through a simple manufacturing process while suppressing cost increase by making a through hole to be fitted with a metal ball in a metal plate and filling the through hole with a brazing filler metal at the time of electrical connection of the metal plate and a conductor on a package base.
- SOLUTION: A package base, i.e., an insulation film, is integrated with a conductor 2 and provided with a through hole at a part matching the position of electrical connection with a metal plate 5 for enhancing the rigidity of the conductor 2 and the entire package thereby enhancing the handling performance. The joint of a semiconductor chip 1 to the metal plate 5 is coated with a conductive adhesive 7 whereas the joint of the insulation film is coated with an insulating adhesive and then they are hot pressed while being aligned with the metal plate 5. A metal ball 10 coated with a brazing filler metal 11 is then inserted into a through hole 9 made in the metal plate 5 and the brazing filler metal 11 is thermally fused to connect the metal plate 5 electrically with the conductor 2 through the metal ball 10.
- RN - JP10326963 A 19981208
- PD - 1998-12-08
- ABD - 19990331
- ABV - 199903
- AP - JP19970150053 19970523
- PA - NEC CORP
- IN - UCHIDA HIROYUKI
- I - H05K3/40 ;H05K3/34



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## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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DETAILED DESCRIPTION

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## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] Especially this invention relates to the structure of the package for semiconductor devices which made the film-like insulator the base about a semiconductor device.

[0002]

[Description of the Prior Art] Conventionally, the tape carrier package called "TCP" is used as a package for semiconductor devices using the film-like insulator. This has the structure which carried out concurrency derivation of the external terminal in the four orientation, and used the connection technique called TAB for connection of a semiconductor chip and a package.

[0003] Since this TCP corresponded to many-items child-ization of a semiconductor device in recent years, it developed the terminal derivation position in the shape of a grid to the flat-surface section of a film-like insulator, and was set to BGA (ball grid array) which doubled with this and also changed the terminal configuration spherically from the rectangle. BGA divides the name according to the modality of package base, and what uses a film-like insulator is named "tape BGA" generically.

[0004] The plan and cross section of tape BGA are shown in the drawing 8 and the drawing 9, respectively. As shown in the drawing 8 and the drawing 9, tape BGA also forms the conductor 33 connected to the insulating film 31 with a semiconductor chip 32, and the solder ball 34 which performs electrical connection with the exterior on the flat surface of the insulating film 31 is arranged in the shape of a grid. A semiconductor chip 32 is closed from the open air with a resin 35 in a chip front face, and is being fixed with a metal plate 36 and the adhesives 37 together with the insulating film 31. The role of a metal plate 36 gives rigidity to the whole package, and it is given in order to improve handling nature.

[0005] The impedance of a conductor 33 increases by detailed-ization accompanied by the formation of many pins, and the problem of tape BGA shown in the drawing 8 and the drawing 9 is in the point that a limit is applied to a fast turn around.

[0006] In order to solve this problem, as shown in drawing 10, a conductor layer is prepared in both sides of the insulating film 38. By considering as the conductor 39 which connects one side with a semiconductor chip or an external terminal, making another side into the grounding plane 40 used as grounding potential, and a conductor 39 serving as micro-stripe structure tape BGA which raised the high-speed electrical property -- or as shown in drawing 11, tape BGA which connected electrically the metal plate 41 prepared in order to raise handling nature, and micro-stripe-ized the conductor 42 is also developed

[0007] In drawing 11, in order to make a metal plate 41 into grounding potential, the adhesives 44 which fix a semiconductor chip 43 first are made into conductivity, a through hole 46 is formed in the solder ball 45 (external terminal) latest at a metal plate 41, and it connects with a conductor 42 with solder 47. Although stabilization of grounding potential is attained and the high-speed electrical property is raised by this, since the insulating film 48 and the adhesives 49 with which solder is not damp intervene between connectors-ed, soldering of a metal plate 41 and the conductor 42 takes a manufacture process complicated for obtaining the stable electrical connection.

[0008] The outline of a connection process is shown in drawing 12. First, it attaches with the conductor 42 which attaches the solder ball 45, and the 100-200-micrometer through hole 50 is

formed in the insulating film 48 of section right above. Adhesives 49 avoid and apply a through hole 50. A through hole 46 is formed also like the metal plate 41 corresponding to this through hole 50 position.

[0009] The solder ball 45 which performed and fused vacuum adsorption etc. from the field which pasted up the insulating film 48 of a metal plate 41, and the opposite side after it attached the solder ball 45 in such the status and the solder ball 45 had sometimes fused is sucked up to the through hole 51 of a metal plate 41. This secures the electrical installation of a metal plate 41 and the conductor 42.

[0010]

[Problem(s) to be Solved by the Invention] However, there are the following problems in tape BGA which raised the high-speed electrical property shown in the drawing 10 and the drawing 11.

[0011] That is, in tape BGA shown in drawing 10, the film which has two conductor layers is expensive, and a conductor serves as the 4 to 5 times as many increase in a cost as this compared with the thing of one layer.

[0012] Moreover, tape BGA shown in drawing 11 has a complicated manufacture process, and special equipments, such as vacuum adsorption, need to be used for it, and it has troubles, such as increase of a manufacturing cost, and protraction of the manufacture time necessary for completion.

[0013] Therefore, this invention is made in view of the above-mentioned trouble, and the purpose is to offer [ simple and ] the semiconductor device which can manufacture in the stable manufacture process and inhibits increase of a cost while it attains the stable high-speed electrical property.

[0014]

[Means for Solving the Problem] In order to attain the aforementioned purpose, a connection is constituted by low material and the metal sphere by giving electrical installation in the conductor of the shape of the metal plate with which the semiconductor device of this invention secures the rigidity of a semiconductor device, and a package base, and it has the structure which prepared the through hole which fits into a metal plate with a metal sphere.

[0015]

[Embodiments of the Invention] The gestalt of operation of this invention is explained using a drawing.

[0016] [Gestalt 1 of operation] view 1, the drawing 2, and the drawing 3 show the plan of the semiconductor device which makes the gestalt of operation of the 1st of this invention, an A-A' line cross section, and rear view, respectively.

[0017] When drawing 1 - view 3 is referred to, tape BGA of the gestalt of this operation The conductor 2 which performs a semiconductor chip 1 and electrical installation as main configuration members, The insulating film 3 which supports a conductor 2, and the solder ball 4 connected as an external terminal, The metal plate 5 which raises the rigidity of the whole package and raises handling nature, The semiconductor chip 1 is had and constituted in the airtight and the resin 6 to protect. Electric and the electroconductive glue 7 which performs the mechanical connections of a semiconductor chip 1 and the metal plate 5, In order to connect the insulating adhesives 8 on which a metal plate 5 and the insulating film 3 are pasted up, and a conductor 2 and the metal plate 5, in the through hole 9 prepared in the metal plate 5, it has the metal sphere 10 arranged so that a conductor 2 may be touched, and the opening between a through hole 9 and the metal sphere 10 is filled up with the low material 11.

[0018] Here, the manufacture process of tape BGA of the gestalt of this operation is explained. The drawing 4 and the drawing 5 are process cross sections having shown the main manufacturing processes of the semiconductor device of the gestalt of operation of the 1st of this invention in the order of the process. In addition, the part view of the drawing 4 and the drawing 5 is only carried out on the convenience of a drawing creation.

[0019] First, the insulating film 3 used as a package base is united with a conductor 2. Moreover, a through hole 12 is formed in the fraction which agrees with the part which carries out electrical connection of a conductor 2 and the metal plate 5 at a back process on the insulating film 3 (refer to drawing 4 (A)).

[0020] As a manufacturing process, a semiconductor chip 1 and the conductor 2 are connected first (refer to drawing 4 (B)). The connection technique used at this time uses the heating pressurization

adhesion technique between the metals called TAB (Tape Automated Bonding).

[0021] Next, an electroconductive glue 7 is applied to semiconductor chip 1 jointing, the insulating adhesives 8 are respectively applied to the metal data 5 at the jointing of the insulating film 3, position doubling is carried out to a metal plate 5, and heating pressurization adhesion is carried out (refer to drawing 4 (C)). In the case of this adhesion, since it is necessary to protect the front face of a semiconductor chip 1, the pressurization of this fraction uses an India rubber etc. as a pad.

[0022] Next, the metal sphere 10 which made the front face put the low material 11 on the through hole 9 prepared in the metal plate 5 is inserted (refer to drawing 4 (D)), flux is supplied, and electrical installation is performed for a metal plate 5 and the conductor 2 through the low material 11 and the metal sphere 10 by heating and carrying out melting in the low material 11 (refer to drawing 5 (E)).

[0023] Position doubling of the solder ball 4 which finally serves as an external terminal is carried out, it makes melting connection, and tape BGA is completed by filling up the periphery of a semiconductor chip 1 with a resin 6 (refer to drawing 5 (F)).

[0024] Although both the low material 11 used for connection of the solder ball 4 and the metal plate 5 consists of a low melting point metal, it becomes possible [ carrying out a remelting at the time of connection of the solder ball 4 by making the low material 11 into the thing of a high-melting point more, and preventing faults, such as a position gap, ].

[0025] Very simple and tape BGA which can acquire the connection process of the stable metal plate and raised the target high-speed electrical property can be obtained by adopting above structures and manufacturing processes.

[0026] [Gestalt 2 which is operation] The gestalt of operation of the 2nd of this invention is explained below. Drawing 6 is drawing showing the cross section of a semiconductor device which makes the gestalt of operation of the 2nd of this invention.

[0027] Reference of drawing 6 makes the connection part by the metal sphere 12 and the low material 13 two places, the insulation film 15 top A section by the side of a semiconductor chip 14, and the insulation film 15 top B section of solder ball 16 right above which is an external terminal.

[0028] a semiconductor chip 14 -- for example, working [ in an about 1GHz RF field ] and a conductor -- since the property like [ property /-like ] a dielectric becomes strong, with the structure of the gestalt of implementation of the above 1st, grounding potential may become unstable and the flow by about 14 semiconductor chip is needed

[0029] In the case of the gestalt of this 2nd operation, as for the formation pattern of a conductor 17, it is general that near of a semiconductor chip 14 is made detailed, and it is necessary to make the dimension of A section detailed according to this to it of B section. However, the manufacture process of a semiconductor device becomes being the same as that of the gestalt of the 1st operation.

[0030] [Gestalt 3 which is operation] The gestalt of operation of the 3rd of this invention is explained below. Drawing 7 is drawing showing the cross section of a semiconductor device which makes the gestalt of operation of the 3rd of this invention.

[0031] It is based on what is depended on the specification of Japanese Patent Application No. 137224 [ eight to ] (un-opening to the public at the time of this application application) in the semiconductor device shown in drawing 7 . In this semiconductor device, a conductor is prepared in both sides of the insulating film 18, while a signal line 19 and another side are used as a power layer 20. The base which presented this three-tiered structure is pasted up with a metal plate 22 with the insulating adhesives 21. The connection with a semiconductor chip 23 is connected by the bonding wire 24. A connection method of construction turns into thermocompression bonding etc.

[0032] In order to use a metal plate 22 with grounding potential also with this semiconductor device, it is necessary to perform the solder ball 25 and electrical installation which are an external terminal. Therefore, connection by the metal sphere 26 and the low material 27 which make the characteristic feature of this invention is made right above [ solder ball 25 ].

[0033] At this time, patterning of the connection pattern 28 and the power layer 20 of the metal sphere 26 is carried out so that an insulating separation can be carried out. Moreover, the connection with the grounding potential of the about 23-semiconductor chip metal plate 22 copes with it from a semiconductor chip 23 by carrying out thermocompression bonding of the bonding wire 24 to the direct metal plate 22.

[0034] Even when the base which has a conductor layer is used for both sides of an insulating film by adopting such structure, the price hike with the whole semiconductor device is suppressed by adopting wirebonding with a manufacturing cost cheaper than TAB technique in a manufacture process possible [ giving the high value added of an installation of a power layer ].

[0035]

[Example] That it should explain still in detail about the above-mentioned gestalt of operation, drawing reference is carried out about the example of this invention, and it explains below.

[0036] [Example 1] view 1 - view 3 is the plan showing one example of this invention, an A-A' cross section, and rear view. When drawing 1 - view 3 is referred to, tape BGA of one example of this invention As the insulating film 3 with a thickness [ which supports the conductor 2 with a thickness / which performs a semiconductor chip 1 and electrical installation / of 10-20 micrometers, and the conductor 2 ] of 50-75 micrometers, and an external terminal The solder ball 4 which consists of a \*\*\*\* eutectic alloy, the metal plate 5 which raises the rigidity of the whole package and raises the handling nature, and the semiconductor chip 1 before and behind 200 degrees C of the melting points consist of a diameter of 0.7-0.8mm to connect including the airtight and the resin 6 to protect.

[0037] The metal plate 5 serves as the shape of a concave whose other fractions the semiconductor chip 1 fixing section is about 0.5mm in about 0.2mm in thickness. A semiconductor chip 1 and the metal plate 5 electric and in order to connect the insulating adhesives 8, and the conductor 2 and the metal plate 5 on which an electroconductive glue 7, the metal plate 5, and the insulating films 3, such as an epoxy resin containing Ag which performs a mechanical connections, are pasted up A cross section the opening between the metal spheres 10, the through holes 9, and the metal spheres 10 which consist of copper etc. for the diameter of 0.5-0.6mm arranged so that a conductor 2 may be touched in the through hole 9 which presented the taper configuration to which the insulating film 3 side becomes thin for the diameter of about 0.5-0.8mm prepared in the metal plate 5 95% of lead, It has filled up with the low material 11 which has the melting point below and over 300 degrees C, such as 5% alloy of tin.

[0038] Here, the manufacture process of tape BGA of one example of this invention is explained. The drawing 4 and the drawing 5 are process cross sections having shown the main manufacturing processes of one example of this invention in the order of the process.

[0039] First, the insulating film 3 used as a package base is united with a conductor 2. Moreover, a through hole 12 is formed in the fraction which agrees with the part which carries out electrical connection of a conductor 2 and the metal plate 5 at a back process on the insulating film 3 (refer to drawing 4 (A)).

[0040] As a manufacturing process, a semiconductor chip 1 and the conductor 2 are connected first (refer to drawing 4 (B)). The connection technique used at this time uses the heating pressurization adhesion technique between the metals called TAB (Tape Automated Bonding).

[0041] Next, an electroconductive glue 7 is applied to semiconductor chip 1 jointing, the insulating adhesives 8 are respectively applied to a metal plate 5 at insulating film 3 jointing, position doubling is carried out to a metal plate 5, and heating pressurization adhesion is carried out (refer to drawing 4 (C)). In the case of this adhesion, since it is necessary to protect the front face of a semiconductor chip 1, the pressurization of this fraction uses an India rubber etc. as a pad.

[0042] Next, the metal sphere 10 which made the low material 11 put on the front face of a through hole 9 established in the metal plate 5 by the thickness of 10-20 micrometers is inserted (refer to drawing 4 (D)), flux is supplied, and electrical installation is performed for a metal plate 5 and the conductor 2 through the low material 11 and the metal sphere 10 by heating and carrying out melting in the low material 11 (refer to drawing 5 (E)).

[0043] Finally, position doubling of the solder ball 4 used as an external terminal is carried out, it makes melting connection, and tape BGA is completed by filling up the periphery of a semiconductor chip 1 with a resin 6 (refer to drawing 5 (F)).

[0044] Although both the low material 11 used for connection of the solder ball 4 and the metal plate 5 consists of a low melting point metal, it becomes possible [ carrying out a remelting at the time of connection of the solder ball 4 by making the low material 11 into the thing of a high-melting point more, and preventing faults, such as a position gap, ].

[0045] Very simple and tape BGA which can acquire the connection process of the stable metal plate and raised the target high-speed electrical property can be obtained by adopting above structures and manufacturing processes.

[0046] [Example 2] The 2nd example is explained below. Drawing 6 is a cross section showing the 2nd example of this invention.

[0047] Reference of drawing 6 makes the connection part by the metal sphere 12 and the low material 13 two places of the insulation film 15 top B section of solder ball 16 right above which is the insulation film 15 top A section by the side of a semiconductor chip 14, and an external terminal.

[0048] under an operation in the RF field where 1GHz of semiconductor chips 14 is near -- a conductor -- since the about [ specific-inductive-capacity:epsilons=12 ] property like a dielectric becomes strong from the-like property, with the structure of the 1st example, the flow by the low resistance by about 14 semiconductor chip is [ that grounding potential tends to become unstable ] needed In the case of this 2nd example, as for the formation pattern of a conductor 17, it is general that near of a semiconductor chip 14 is made detailed, and it is necessary to make the dimension of A section detailed according to this to it of B section. For example, it of B section is about 0.5mm like the 1st example to the minimum diameters of A section through hole being 0.2-0.3. It doubles with the size of this through hole, the size of a metal sphere is also changed, and a metal sphere with a diameter of about 0.6mm is used in about 0.25mm and B section in A section. However, the manufacture process of a semiconductor device becomes being the same as that of the 1st example.

[0049] [Example 3] The 3rd example of this invention is explained below. Drawing 7 is a cross section showing the 3rd example of this invention.

[0050] It is based on what is depended on the above-mentioned Japanese-Patent-Application-No. 137224 [ eight to ] specification in the semiconductor device shown in drawing 7 . In this semiconductor device, a conductor is prepared in both sides of the insulating film 18, while a signal line 19 and another side are used as a power layer 20. It pastes up with the metal plate 22 into which the center section was bent to the concave and the base which presented this three-tiered structure was processed by about 0.2mm in thickness with the insulating adhesives 21 of a polyimide system. The connection with a semiconductor chip 23 is connected by the bonding wire 24 with a diameter of 20-30 micrometers. A connection method of construction turns into thermocompression bonding etc. In order to use a metal plate 22 with grounding potential also with this semiconductor device, it is necessary to carry out the solder ball 25 and electrical installation which are an external terminal. Therefore, connection by the metal sphere 26 and the low material 27 which are this invention is made right above [ solder ball 25 ]. The metal sphere 26 and the low material 27 are good with the same quality of the material as a previous example. At this time, patterning of the connection pattern 28 and the power layer 20 of the metal sphere 26 is carried out so that an insulating separation can be carried out. Moreover, the connection with the grounding potential of the about 23-semiconductor chip metal plate 22 copes with it from a semiconductor chip 23 by carrying out thermocompression bonding of the bonding wire 24 to the direct metal plate 22.

[0051] Even when the base which has a conductor layer is used for both sides of an insulating film by adopting such structure, the price hike with the whole semiconductor device is suppressed by adopting wirebonding with a manufacturing cost cheaper than TAB technique in a manufacture process possible [ giving the high value added of an installation of a power layer ].

[0052]

[Effect of the Invention] Electrical installation of the metal plate which secures the rigidity of a semiconductor device according to the semiconductor device of this invention as explained above, and the conductor on a package base is given, and a connection is constituted by low material and the metal sphere, and it is having the structure which prepared the through hole which fits into a metal plate with a metal sphere, and is enabled to acquire the stable manufacture process simple with the stable high-speed electrical property.

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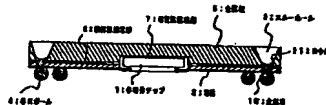
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WPI

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- AN - 1999-091953 [08]

PAJ

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- SOLUTION: A package base, i.e., an insulation film, is integrated with a conductor 2 and provided with a through hole at a part matching the position of electrical connection with a metal plate 5 for enhancing the rigidity of the conductor 2 and the entire package thereby enhancing the handling performance. The joint of a semiconductor chip 1 to the metal plate 5 is coated with a conductive adhesive 7 whereas the joint of the insulation film is coated with an insulating adhesive and then they are hot pressed while being aligned with the metal plate 5. A metal ball 10 coated with a brazing filler metal 11 is then inserted into a through hole 9 made in the metal plate 5 and the brazing filler metal 11 is thermally fused to connect the metal plate 5 electrically with the conductor 2 through the metal ball 10.
- PN - JP10326963 A 19981208
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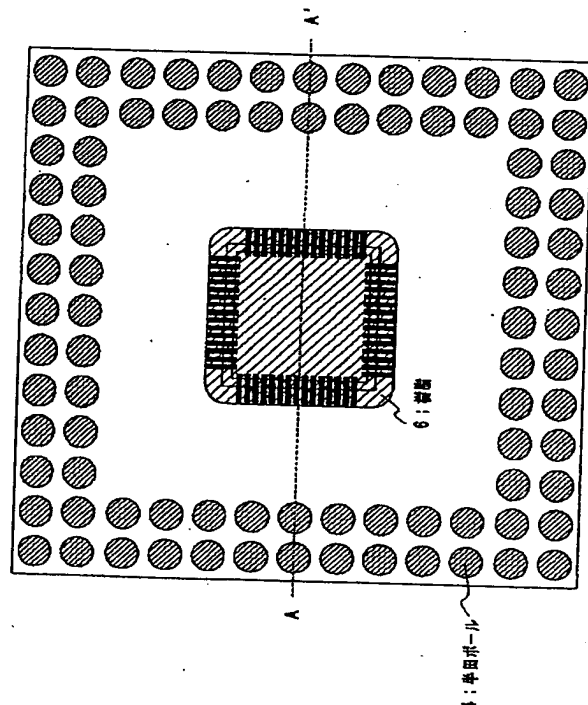
(74) 代理人 弁理士 加藤 朝道

(54) 【発明の名称】 半導体装置用パッケージおよびその製造方法

(57) 【要約】

【課題】絶縁フィルムを使用した多端子型半導体装置用パッケージであるテープBGA等の半導体装置において、安定した高速電気特性を達成すると共に、簡便かつ安定した製造プロセスで製造できコストの増大を抑止する半導体装置を提供する。

【解決手段】金属板を接地層と接続するために金属板にスルーホールを設け、このスルーホールにロウ材を表面に被着させた金属球を挿入・嵌合し、ロウ材を溶融させることで金属板を接地電位に接続する。





スで製造できコストの増大を抑止する半導体装置を提供することにある。

【0014】

【課題を解決するための手段】前記目的を達成するため、本発明の半導体装置は、半導体装置の剛性を確保する金属板とパッケージ基体状の導体を電気的接続を施し、接続部はロウ材と金属球により構成され、金属板に金属球と嵌合するスルーホールを設けた構造を有する。

【0015】

【発明の実施の形態】本発明の実施の形態について図面を用いて説明する。

【0016】〔実施の形態1〕図1、図2、及び図3は、本発明の第1の実施の形態をなす半導体装置の平面図、A-A'線断面図、及び背面図をそれぞれ示したものである。

【0017】図1～図3を参照すると、この実施の形態のテープBGAは、主な構成部材として、半導体チップ1と電気的接続を行う導体2と、導体2を支持する絶縁フィルム3と、外部端子として接続する半田ボール4と、パッケージ全体の剛性を高めハンドリング性を向上させる金属板5と、半導体チップ1を気密・保護する樹脂6と、を備えて構成されており、半導体チップ1と金属板5との電気的および機械的接続を行う導電性接着剤7と、金属板5と絶縁フィルム3を接着する絶縁性接着剤8と、導体2と金属板5を接続するために金属板5に設けたスルーホール9内に導体2と接するように配置した金属球10と、を備えスルーホール9と金属球10の隙間をロウ材11で充填している。

【0018】ここで、この実施の形態のテープBGAの製造プロセスについて説明する。図4及び図5は、本発明の第1の実施の形態の半導体装置の主要製造工程を工程順に示した工程断面図である。なお図4及び図5は、単に図面作成の都合で分図されたものである。

【0019】まず、パッケージ基体となる絶縁フィルム3は導体2と一体化している。また、絶縁フィルム3には後工程で導体2と金属板5の電気接続を実施する箇所と合致する部分にスルーホール12を設ける(図4(A)参照)。

【0020】製造工程としては、まず半導体チップ1と導体2を接続する(図4(B)参照)。このとき用いる接続技術はTAB(Tape Automated Bonding)と呼ばれる金属間の加熱加圧接着技術を用いる。

【0021】次に金属データ5に半導体チップ1接着部には導電性接着剤7を、絶縁フィルム3の接着部には絶縁性接着剤8を各々塗布し、金属板5と位置合わせして加熱加圧接着する(図4(C)参照)。この接着の際、半導体チップ1の表面を保護する必要があるためこの部分の加圧は弾性ゴムなどを緩衝材として使用する。

【0022】次に金属板5に設けたスルーホール9に表

面にロウ材11を被着させた金属球10を挿入し(図4(D)参照)、フラックスを供給し、ロウ材11を加熱・熔融することで金属板5と導体2がロウ材11、金属球10を介して電気的接続が行われる(図5(E)参照)。

【0023】最終的に外部端子となる半田ボール4を位置合わせし熔融接続し、樹脂6で半導体チップ1の周囲を充填することでテープBGAは完成する(図5(F)参照)。

【0024】半田ボール4と金属板5の接続に用いるロウ材11はともに低融点金属から成るが、ロウ材11をより高融点のものにすることで半田ボール4の接続時に再熔融し位置ずれ等の不具合を防止することが可能となる。

【0025】以上のような構造および製造工程を採用することで極めて簡便かつ安定した金属板の接続工程を得ることが可能で、目的の高速電気特性を向上させたテープBGAを得ることができる。

【0026】〔実施の形態2〕次に本発明の第2の実施の形態について説明する。図6は、本発明の第2の実施の形態をなす半導体装置の断面を示す図である。

【0027】図6を参照すると、金属球12とロウ材13による接続箇所を半導体チップ14側の絶縁フィルム15上A部と、外部端子である半田ボール16直上の絶縁フィルム15上B部の2箇所としている。

【0028】半導体チップ14は例えば1GHz近い高周波領域での動作中、導体的性質より誘電体的な性質が強まるため、前記第1の実施の形態の構造では、接地電位が不安定になることがあり、半導体チップ14近傍での導通が必要となってくる。

【0029】この第2の実施の形態の場合、導体17の形成パターンは半導体チップ14の近傍ほど微細化されているのが一般で、これに従いA部の寸法は、B部のそれに対して微細化する必要がある。ただし、半導体装置の製造プロセスは第1の実施の形態と同様となる。

【0030】〔実施の形態3〕次に本発明の第3の実施の形態について説明する。図7は、本発明の第3の実施の形態をなす半導体装置の断面を示す図である。

【0031】図7に示した半導体装置では、特願平8-137224号(本願出願時未公開)の明細書によるものを基本としている。この半導体装置では、絶縁フィルム18の両面に導体を設け一方を信号線19、もう一方を電源層20として使用する。この3層構造を呈した基体を絶縁性接着剤21で金属板22と接着する。半導体チップ23との接続はボンディングワイヤ24で接続する。接続工法は熱圧着法などとなる。

【0032】この半導体装置でも金属板22を接地電位で使用するため、外部端子である半田ボール25と電気的接続を行う必要がある。従って、本発明の特徴をなす、金属球26とロウ材27による接続を、半田ボール

【0049】〔実施例3〕次に本発明の第3の実施例について説明する。図7は、本発明の第3の実施例を示す断面図である。

【0050】図7に示した半導体装置では、上記特願平8-137224号明細書によるものを基本としている。この半導体装置では、絶縁フィルム18の両面に導体を設け一方を信号線19、もう一方を電源層20として使用する。この3層構造を呈した基体をポリイミド系の絶縁性接着剤21で厚さ0.2mm程度で中央部を凹状に折り曲げ加工した金属板22と接着する。半導体チップ23との接続は直径20〜30μmのボンディングワイヤ24で接続する。接続工法は熱圧着法などとなる。この半導体装置でも金属板22を接地電位で使用するため、外部端子である半田ボール25と電気的接続を実施する必要がある。従って本発明である金属球26とロウ材27による接続を半田ボール25直上で実施する。金属球26とロウ材27は先の実施例と同様の材質でよい。このとき金属球26の接続パターン28と電源層20は絶縁分離できるようにパターンニングしておく。また半導体チップ23近傍での金属板22の接地電位への接続は、半導体チップ23からボンディングワイヤ24を直接金属板22へ熱圧着することで対処する。

【0051】このような構造を採用することで、絶縁フィルムの両面に導体層を有する基体を用いた場合でも電源層の設置という高付加価値を与えることが可能で、かつTAB技術よりも製造コストが廉価なワイヤボンディングを製造プロセスで採用することで半導体装置全体の価格上昇を抑えている。

【0052】

【発明の効果】以上説明したように本発明の半導体装置によれば、半導体装置の剛性を確保する金属板とパッケージ基体上の導体との電気的接続を施し、接続部はロウ材と金属球により構成され、金属板に金属球と嵌合するスルーホールを設けた構造を有することで、安定した高速電気特性と簡便かつ安定した製造プロセスを得ることが可能となる。

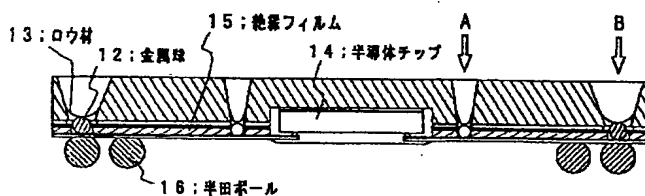
【図面の簡単な説明】

【図1】本発明の一実施例の平面図である。

【図2】図1のA-A'線断面図である。

【図3】図1の背面図である。

【図6】



【図4】本発明の一実施例の製造工程図である。

【図5】本発明の一実施例の製造工程図である。

【図6】本発明の第2の実施例の断面図である。

【図7】本発明の第3の実施例の断面図である。

【図8】従来のテープBGAの平面図（接地電位層なし）である。

【図9】従来のテープBGAの断面図（設置電位層なし）である。

【図10】従来のテープBGAの断面図（接地電位層：導体層）である。

【図11】従来のテープBGAの断面図（接地電位層：金属板）である。

【図12】図11のテープBGAの接続部分概略図である。

【符号の説明】

1、14、23 半導体チップ

2、17 導体

3、15、18 絶縁フィルム

4、16、25 半田ボール

5、22 金属板

6 樹脂

7 導電性接着剤

8、21 絶縁性接着剤

9 スルーホール

10、12 金属球

11、13 ロウ材

19 信号線

20 電源層

24 ボンディングワイヤ

30 31、38、48 絶縁フィルム

32、43 半導体チップ

33、39、42 導体

32、45 半田ボール

35 樹脂

36、41 金属板

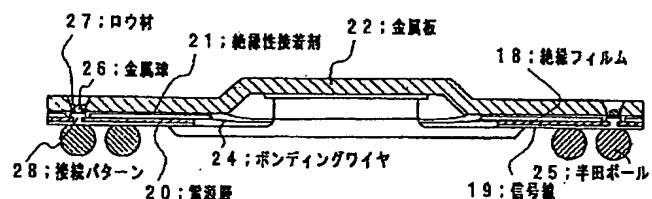
37、44、49 接着剤

40 接地プレーン

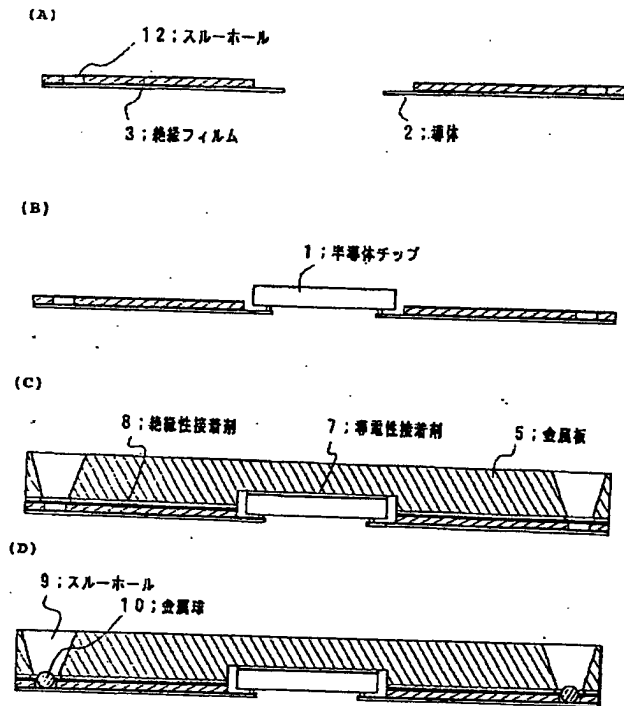
46、50、51 スルーホール

47 半田

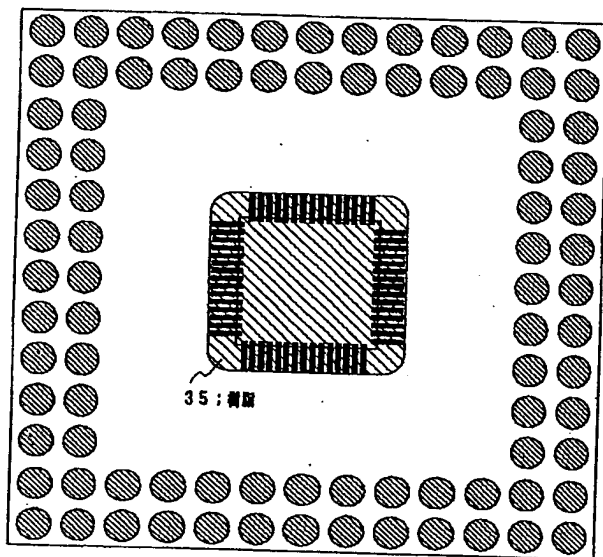
【図7】



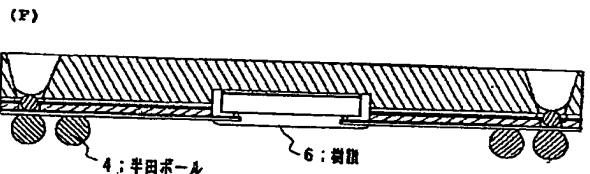
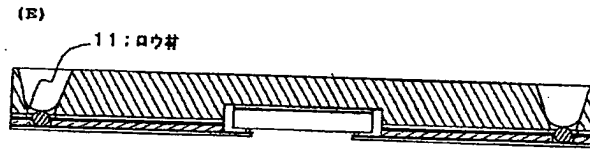
【図4】



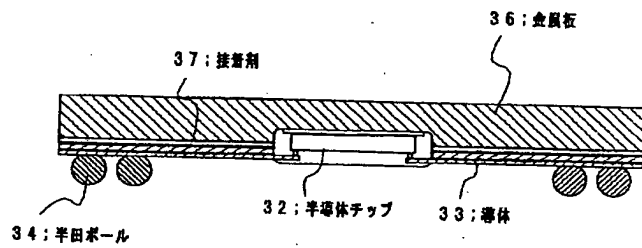
【図8】



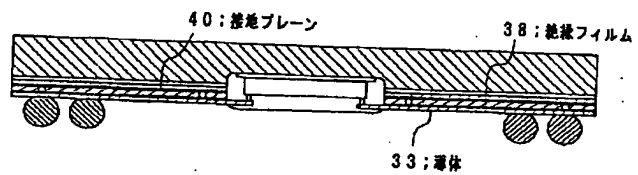
【図5】



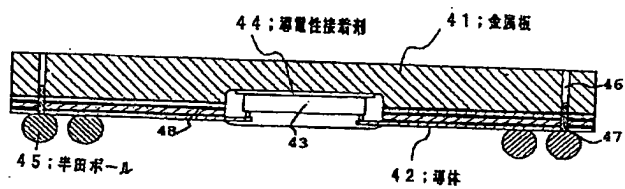
【図9】



【図10】



【図11】



【図12】

